

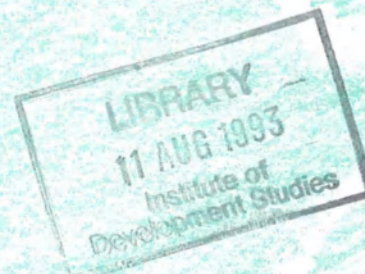
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FINANCIAL SYSTEM REGULATION, DEREGULATION AND SAVINGS MOBILIZATION IN NIGERIA

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AFRICAN ECONOMIC RESEARCH CONSORTIUM

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**Financial system regulation, deregulation
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I Introduction

Banks are perhaps the most heavily regulated of all businesses, being providers of the finance which is often viewed as "the lubricant of the economy" (Cameron *et al.*, 1967). As financial intermediaries, banks channel funds from surplus economic units to deficit units to facilitate trade and capital formation. Accordingly, they are not free to do what they like with funds deposited with them. The funds are expected to be managed in accordance with specified statutory requirements laid down by government or monetary authorities. Such regulations may stipulate the percentage of the bank's deposits that must be held in cash or liquid assets, the reserve requirement, capital adequacy, etc. These regulations are aimed at ensuring the soundness of the banking system and minimizing bank failures so as to sustain confidence in the financial system.

Besides these "soundness-inducing" or prudential regulations, governments the world over intervene in the operations of their countries' financial systems. The failure of the price-market mechanism to ensure that individual rationality approximates social rationality has often been used as the rationale for government controls on the economy. Thus, in the United States, government intervention in the operations of the financial markets resulted in the introduction of Regulation Q which imposed interest-rate ceilings on the deposits of Federal Reserve member banks between 1933 and 1983. Among other objectives, the regulation aimed at:

- preserving the soundness of the banking system by preventing excessive competition for deposits between commercial banks; and
- helping to control credit and monetary aggregates and thereby aggregate demand (Winningham and Hogan, 1980).

The imperfections and externalities existing in the financial markets of developing countries are much more pronounced than those of the developed industrial economies of the United States, Western Europe, and Japan. Accordingly, government intervention in the operation of the financial market

in these countries is more pervasive. Apart from correcting imperfections in the market, government intervention in the operation of Third World financial markets is aimed at:

- redirecting credits into sectors or sub-sectors deemed to have high social rates of return and low commercial rates of return; and
- increasing the flow of income towards identifiable "disadvantaged" groups in the population.

However, experience has shown that government intervention in the operation of the financial market does not often achieve the intended objectives. Instead it results in distortions like suppression of equity markets and inducement of present consumption at the expense of savings. To remove or minimize these distortions, economists and bankers have called for deregulation of the financial systems. Price distortion in the financial market is judged by how far the interest rate is negative in *real terms* (disincentive to save and misallocations of funds), or by excessive high positive values of interest in *nominal terms* (undue discouragement to invest) (Agarwala, 1985).

The United States spearheaded the deregulation of the financial market with the abolition of Regulation Q in 1983. A number of Third World countries, in situations of crushing debt burden and dwindling foreign exchange earnings, have also adopted policies deregulating their economies, and in particular the financial market, as part of structural adjustment programmes (SAPs) aimed at ensuring that the forces of demand and supply are assigned greater roles than hitherto in the allocation of resources. As part of its SAP, Nigeria deregulated interest rates and relaxed the policy of directed credits on 1 August 1987. Received theory is believed to have been behind this policy decision, although empirical evidence on determinants of growth and money supply in Nigeria is inconclusive regarding the role played by interest rates during the era of regulation.

This study aims to provide a detailed analysis of the behavioural patterns of savings in Nigeria during the eras of financial regulation and deregulation. We then offer recommendations for government monetary policy measures in Nigeria.

The problem

Various developing countries are undergoing SAPs designed to revamp their economies by diversifying their productive bases, placing less emphasis on the

external sector, and allowing market forces to play a dominant role in the allocation of resources. In many current macroeconomic adjustment policies in these economies, anti-inflation policies based on a restrictive rate of money supply expansion and interest rate deregulation have been adopted. Yet empirical evidence has shown that the monetarist explanation of inflation is not fully in accord with what happens in some of these countries (Saini, 1982; Rwegasira, 1979, 1983; London, 1989). Moreover, London showed that while there is an explicit link between the rate of monetary expansion and inflation in cross-sectional equations covering several countries and averaged over several years in Africa, the same is generally not true for individual countries in time-series analysis or in cross-section studies covering shorter periods. He therefore queried the broad application of restrictive anti-inflation monetary policy to all of Africa without taking into account empirical evidence from each country.

Studies relating interest rates to savings, investments, and money supply in Nigeria, though limited in scope and fraught with methodological problems, are inconclusive. While some (Lambo, 1986; Ajayi and Ojo, 1986; Oyejide, 1972; Ajayi, 1973, 1974; Teriba, 1974; Ajewole, 1989) conclude that interest rate is an insignificant factor, others (e.g. Owosekun, 1978) conclude that it is significant. We note, however, that most of these studies used nominal interest rate as opposed to *ex ante* real interest rate which in theory is known to affect savings and investment decisions.

In spite of these findings, Nigeria deregulated interest rates and relaxed the policy of directed credits based on the apparent premise that reasonably high *ex ante* real interest rates encourage savings and hence economic growth. The applicability or otherwise of this received theory in the Nigerian situation, therefore, requires investigation.

The study

The need for the study

Policy analysis research has contributed much to policy decision-making in advanced countries. In Nigeria, as in most developing economies, economic policy decisions are based mainly on untested received theories, rules of thumb, hunches, and, at best, the "experience" of technocrats. It is known that very often received theories cannot be transplanted. Their applicability in an environment is affected by a host of factors, among which are the levels of economic development and political advancement, as well as the attitudes and value systems of the people concerned.

Perhaps the most important of these factors is the level of economic development. For example, a number of received monetary policy prescriptions assume the existence of well-developed money and capital markets for successful policy execution. These are non-existent in many developing countries like Nigeria. Consequently, in the absence of such necessary provisions, there is a need periodically to study the behavioural reactions of Third World nations to macroeconomic policy prescriptions in order to assess how "well" they respond to such policies and determine what modifications can be made to them to ensure that their implementation is successful. It may even be possible that the results of such empirical studies may lead to the reformulation of received theories to explain adequately the economic phenomena in these nations.

Given the pervasive influence of the current macroeconomic structural adjustment on the economy of Nigeria, and particularly the influence on the financial sector (e.g. exchange rate and interest rate deregulation) which drives the engine of growth of the economy, there is an urgent need to study the response of the financial system *ex post* to the policies of regulation and deregulation. Such a study should be able to reveal the relevant determinants of successful implementation of financial adjustment policies in Nigeria.

Objectives of the study

The study aims at determining the applicability of received theories of regulation and deregulation of the financial system to the Nigerian environment. In particular, the study will test the validity of the hypothesis that financial conditions do matter in savings behaviour in Nigeria, i.e. positive real interest rates encourage savings.

Specifically, the objectives of the study are as follows.

1. to analyze the impact of direct government intervention in the operation of the financial system on savings;
2. to analyze the impact of deregulation of the financial system on savings;
3. to validate the applicability, or otherwise, of received theories of regulation and deregulation of the financial system in the Nigerian case; and
4. to offer policy recommendations relating to the successful operation of regulatory and deregulatory policies in the Nigerian financial system.

Methodology

The study adopted an *ex post* analysis of the Nigerian banking system in order to determine the impact of regulation and deregulation of the system on the savings mobilization behaviour of Nigerians, using data generated between 1969 and 1989. The choice of 1969, ten years after the regulation began, is based on the premise that Nigeria adopted strict regulation of the financial system (i.e. started the policy of directed credits and interest rate ceilings) on 1 July 1969 (Oyejide and Soyibo, 1987). It was argued in Soyibo and Adekanye (1990a) that the link between regulation of the financial system on the one hand, and savings, investment, and growth on the other, is the *ex ante* real interest rate. Most previous studies used the *ex post* real interest rate, which is directly measurable. In this study, a variation of *ex ante* real interest rate, the adjusted *ex ante* real interest rate was used (see Appendix).

In the assessment of the impact of policies of regulation and deregulation on savings mobilization, a regression analysis approach was used.

There are many standard approaches to this methodology in the literature. Arrieta (1988) gives an excellent review of such approaches. They test the validity, or otherwise, of the McKinnon-Shaw hypothesis of positive interest responsiveness to savings and the beneficial effects of financial liberalization policies on economic growth. Some of these standard approaches will be replicated in this study to ensure cross-country comparison of our results.

Specifically, the following (modified) specifications of the models reported by Arrieta (1988) were used in the study.

$$(1) S_d / y = f(g, y, r^e, S_f / y, S_d / y_{-1})$$

where S_d = private savings
 S_f / y = foreign savings ratio
 g = rate of growth of income
 y = real per capita income
 r^e = adjusted *ex ante* real interest rate
 S_d / y_{-1} = lagged savings ratio

Equation (1) is the specification used by Fry (1978).

$$(2) S = f(y, py, g, r^e, S_p)$$

where S = aggregate savings

y = current income
 py = permanent income
 S_f = foreign savings

and other variables as defined previously. Equation (2) is the specification used by Yusuf and Peters (1984).

$$(3) \quad GPS = f(YD, \Delta YD, GPS_{-1}, X/GDP)$$

where GPS = gross private savings
 YD = disposable income
 ΔYD = change in disposable income
 GPS_{-1} = lagged gross private savings
 X/GDP = share of exports in GDP

Equation (3) is the specification used by Leite and Makonnen (1986). For each of the equations (1)-(3), a dummy variable D87 was introduced to capture the effect of financial liberalization. It takes a value of one from 1987 and zero otherwise.

McKinnon and Shaw's models of financial intermediation differ from each other with respect to the transmission mechanism of positive interest responsiveness to growth. While McKinnon's hypothesis constrains the investor to self-finance, Shaw's model does not. McKinnon's model postulates complementarity (i.e. the existence of a conduit) between financial and real assets, Shaw's model, on the other hand, focuses on the role of deposit accumulation in expanding the lending potential of financial intermediaries. Accordingly, Shaw's hypothesis is called the debt-intermediation hypothesis.

This study attempts to validate the transmission mechanism of savings to growth in Nigeria by estimating empirically the money demand functions of McKinnon and Shaw, respectively.

McKinnon's model:

$$(4) \quad (M/p)^d = L(Y/p, I/Y, r^e)$$

where M/p = real stock of money (M_2)
 Y/p = real gross national product
 I/Y = ratio of gross investment to GNP and r^e as previously defined

Shaw's model:

$$(5) \quad (M/p)^d = L(Y/p, v, r^e)$$

where v = vector of opportunity costs in real terms of holding money which can be proxied by $b - p^e$

where b = nominal yield on government bonds (or short-term loan rate if government bonds are unavailable) and
 p^e = expected interest rate.

The data sources used for the study were Central Bank of Nigeria's (CBN) publications, such as the *Monthly Report*, *Annual Report*, *Economic and Financial Review*, augmented by relevant publications of the Federal Office of Statistics, the *Annual Report of the Nigerian Deposit Insurance Corporation*, and the *International Financial Statistics* of the IMF. Development banks like the Federal Mortgage Bank and the Nigerian Industrial Development Bank were also visited to collect data.

Initially, quarterly data were used for estimating equations (1)-(5). This meant that a greater percentage of the data points would have had to be interpolated given that many of the required explanatory variables, where available, are only given as annual figures. This approach was later found to be unsatisfactory. Accordingly, the equations were estimated using only annual data.

II Determinants of savings in Nigeria

Because of lack of data, certain proximate measures were substituted for some response or explanatory variables defined in the original models. For example, for the study, aggregate savings were used in place of other types of savings. For each of the models, we used four types of real interest rate measures: three types of adjusted *ex ante* real interest rate, and the *ex post* real interest rate. The values of these estimates, and how they were determined, are shown in the Appendix.

The three types of adjusted *ex ante* real interest rates are adjusted *ex ante* real commercial bank prime rate, adjusted *ex ante* real maximum term rate, and adjusted *ex ante* real federal savings bank rate. Table A1 of the Appendix shows that data for adjusted *ex ante* real interest rates could only be estimated from 1977 onwards. Accordingly, the regression equations which use the adjusted *ex ante* real rate as an explanatory variable could be estimated using data from 1978 to 1989. However, for the *ex post* rate, we used data from 1971 to 1989. We also included a dummy variable to explain the impact of deregulation on the savings ratio in Nigeria. It takes a value of one from 1987, and zero otherwise.

For the modifications of the savings models discussed in the foregoing, we therefore abbreviated the names of models employed in this study as follows:

- the modified Fry model (MFM), which is a modification of Fry's (1978) model;
- the modified Yusuf and Peters model (MYPM), which is a modification of Yusuf and Peters' (1984) model; and
- the modified Leite and Makonnen model (MLM) which is a modification of Leite and Makonnen's (1986) model.

Tables 1-3 present the regression estimates of these models.

Table 1 Determinants of savings in Nigeria using the MFM (equations in log form)

Eq no	Constant	Real growth of Y	Real per capita Y	Adj. ex ante real rate 1	Adj. ex ante real rate 2	Adj. ex ante real rate 3	Ex post real rate	Foreign saving ratio	Lagged saving ratio	Dummy	R ²	DW
6	-2.4541 (-1.3119)	-0.0220 (-0.0998)	0.3773 (1.520)	0.0042 (0.048)				-0.0124 (-0.2069)	0.2756* (4.3456)	-0.1108 (-0.8332)	0.93	2.16
7	-2.2513 (-1.3119)	-0.0248 (-0.0998)	0.3528 (1.520)		-0.0076 (0.0415)			-0.215 (0.0598)	1.1676* (4.1365)	-0.0988 (-0.7711)	0.93	2.01
8	-2.4494 (-1.3972)	-0.0200 (-0.4154)	0.3744 (1.6039)			0.0100 (0.2096)		-0.00097 (-0.1720)	1.2013* (4.5531)	-0.1175 (-0.8838)	0.93	2.23
9	0.1279 (0.3048)	-0.0499 (-1.0147)	0.0715 (0.7660)				0.0236 (0.3536)	0.0166 (0.3007)	0.8821* (4.5984)	-0.0611 (0.3759)	0.93	1.91

t-values in parenthesis

* significant at 1% level

Table 2 Determinants of savings in Nigeria using the MYPM (equations in log form)

Eq no	Constant	Current Y	Inflation rate	Foreign savings	Adj. ex ante real rate 1	Adj. ex ante real rate 2	Adj. ex ante real rate 3	Ex post real rate	Dummy	R ²	DW
10	-8.5989* (-4.8257)	1.7445 (11.010)	-0.1135 (-1.7755)	-0.1637** (-2.1381)	-0.0573 (-0.9231)				-0.1542 (0.8011)	0.98	2.01
11	-8.3545* (-4.6914)	1.7252* (11.3430)	-0.1129 (-1.8293)	-0.1662** (-2.2340)		-0.0436 (-1.0311)			-0.1514 (-0.8038)	0.98	2.00
12	-8.3556* (-4.3249)	1.7090* (10.7049)	-0.1107 (-5.484)	-0.1499 (-1.8617)			-0.0436 (-0.5806)		-0.1552 (-0.7202)	0.98	1.99
13	-6.9413* (-17.4746)	1.50145* (31.0130)	-0.0290 (0.9865)	0.0923** (-2.6152)				0.1251** (2.4340)	-0.1543 (-1.6838)	0.98	1.81

t-values in parenthesis

*significant at 1 per cent level

** significant at 5 per cent level

Table 3 Determinants of savings in Nigeria using the MLM (equations in log form)

Eq no	Constant	Disposable Y	Change in disposable Y	Lagged agg savings	Share of export in Y	Adj. ex ante real rate 1	Adj. ex ante real rate 2	Adj. ex ante real rate 3	Ex post real rate	Dummy	R ²	DW
14	6.8237** (2.3705)	0.9294 (-1.6511)	0.0479 (0.9058)	1.3230* (4.0302)	0.1010 (0.3621)	-0.0332 (0.6137)				0.2614 (1.2378)	0.99	2.28
15	7.0453** (2.5705)	-0.9062 (-1.7007)	0.04809 (0.9635)	1.2910* (4.120)	0.0452 (0.1672)		-0.0458 (-0.9983)			0.2977 (1.4772)	0.99	2.36
16	6.8402** (2.2762)	-0.9634 (-1.6701)	0.0489 (0.8909)	1.3432* (3.9704)	0.1485 (0.5215)			-0.0159 (-0.2535)		0.2322	0.99	2.16
17	-3.0518 (-1.2325)	0.7619 (1.2094)	-0.01622 (-0.2224)	0.4782 (1.1968)	-0.1279 (-0.4175)				0.0613 (0.7618)	-0.0627 (-0.3476)	0.99	2.04

t-values in parenthesis

*significant at 1 per cent level

**significant at 5 per cent level

***significant at 10 per cent level

Table 1 shows that of the explanatory variables of the savings ratio, only the lagged savings ratio was significant. It has the hypothesized *a priori* sign. Apart from the non-significance of real growth in GDP in all cases, the estimates have the wrong sign. Foreign savings ratio and per capita GDP have the right sign, though they are not significant.

Table 2 gives the results of the regression model estimation using the MYPM, the modified Yusuf-Peters model. The results show that the model performs well in explaining the determinants of savings in Nigeria. Equation 11 shows that current income and foreign savings are significant determinants of savings. These variables also have the *a priori* sign specification. While the adjusted *ex ante* real interest rate is not a significant determinant of savings in Nigeria, equation 13 shows that the *ex post* real interest rate is a significant determinant and has the right sign. A one percentage point increase in the *ex post* real interest rate will lead to a 0.13 per cent increase in aggregate savings. Equation 13, therefore, seems to suggest, even if only weakly, the applicability of the McKinnon-Shaw financial intermediation hypothesis to Nigeria. However, the dummy variable representing the impact of deregulation on savings mobilization is not significant and also has the wrong sign.

The regression estimates of Table 2 have high explanatory power (R^2 varies between 0.98 and 0.99), and the Durbin-Watson statistic varies between 1.81 and 2.01.

Table 3 presents the result of our estimation of the savings equation using the modified Laite-Makonnen (MLM) approach. The table shows that only lagged aggregate saving is a significant determinant of saving in Nigeria. It also has the *a priori* sign. This result is similar to that obtained using the MFM (Table 1). The non-significance of many of the explanatory variables using the MFM and MLM may not be unconnected with the redefinition of the response variable in both cases. Equation 1 shows that the *original* response variable for the MFM is private savings (or domestic savings), while that of MLM is gross private savings. For both we have used aggregate savings as proxy.

In all three models, except MFM, estimates of the coefficients of all measures of adjusted *ex ante* real interest rate have the wrong sign, while that of the *ex post* real rate has the right sign. The analysis seems to suggest that there is some evidence of the applicability of the McKinnon-Shaw financial intermediation hypothesis to Nigeria, but the evidence is conflicting, even though the conflict may reside in data problems. A study using the exact specifications of Fry (1978) and Leite and Makonnen (1986) may remove this ambiguity.

In summary, the study suggests that the significant determinants of savings in Nigeria are:

- lagged aggregate savings ratio;
- lagged aggregate savings;
- current GDP;
- foreign savings; and
- *ex post* real interest rate.

In Nigeria, domestic savings can also be held in foreign currency. The significance of foreign savings and its right sign seem to suggest the need to encourage Nigerians and other savers to increase savings in foreign currency in the economy. Provision of a conducive investment climate and possible operations of off-shore banking are other policy prescriptions to encourage domestic savings in foreign currency in Nigeria.

The significance of the *ex post* real interest rate suggests that operation of financial liberalization policies in Nigeria may have some support. However, following results in Soyibo and Adekanye (1990b) and others like McKinnon (1988), other complementary policies that ensure economic stability are a *sine qua non* to the successful operation of financial liberalization.

III Demand for money in Nigeria

This section aims at validating the applicability or otherwise of both McKinnon's and Shaw's models of financial intermediation in Nigeria. These models, specified in equations (4) and (5), are estimated in a similar way to equations (1)-(3), i.e. for each of them we used the concepts of the real interest rate developed in the Appendix and also introduced a dummy variable to compute the effects of liberalization on demand for money in Nigeria. Tables 4 and 5 give the results of this exercise.

In Table 4, except in one case, McKinnon's model does not seem to be applicable in the Nigerian context because in equations (18)-(20) none of the variables is significant. As in previous cases, the coefficients of the adjusted *ex ante* real rates have the wrong sign. However, in equation (21), real stock of broad money is significantly determined by real GDP and *ex post* real interest rate. The ratio of inventory to GDP is not a significant determinant of real money stock. Other things being equal, an increase of *ex post* real interest rate by one percentage point will increase real demand for money by 0.29 per cent.

From Table 5 we see that Shaw's model of financial intermediation seems to be more applicable to Nigeria. All adjusted *ex ante* real rates are significant, but have the wrong sign. Besides, all the coefficients of the dummy variable are significant at the 5 per cent level. However, in spite of the significance of the explanatory variable, Shaw's model has less power for explaining the variation in the demand for money in Nigeria than McKinnon's model, as shown in the lower value of R^2 . Thus the results suggest that financial liberalization in Nigeria is supported rather weakly by Nigerian data.

The negative sign of the coefficients of the adjusted *ex ante* real interest rate observed in this study seems absurd. However, we posit that these results suggest that when people expect interest rates to rise, they would rather not hold idle cash, meaning that the demand for money will fall. In this case, people will prefer to invest in interest-bearing securities like treasury bills. This is similar to the Mundell-Tobin hypothesis (Mundell, 1963; Tobin, 1965).

Table 4 Estimation of McKinnon's money demand equation for Nigeria (equations in log form)

Eq no.	Constant	Real GDP	Inv to GDP ratio	Adj. ex ante real rate 1	Adj. ex ante real rate 2	Adj. ex ante real rate 3	Ex post real rate	Dummy	R ²	DW
18	1.7573 (0.2811)	0.8065 (1.1442)	-0.4929 (-1.4823)	-0.0865 (0.0905)				0.0564 (0.2664)	0.47	1.89
19	2.2960 (0.3619)	0.7390 (1.0378)	-0.4444 (-1.3725)		0.0729 (-0.9477)			0.0568 (0.2679)	0.47	1.81
20	0.7282 (0.1157)	0.9072 (1.2663)	-0.4917 (-1.4561)			-0.0824 (-0.8583)		0.0580 (0.2710)	0.46	1.47
21	-5.0475* (-4.7991)	1.4143* (15.9383)	-0.3160				0.0850* (2.7960)	0.0580 (1.4371)	0.96	1.72

t-values are in parenthesis

* significant at 1 per cent level

Table 5 Estimation of Shaw's money demand equation for Nigeria (equations in log form)

Eq no	Constant	Real GDP	Opportunity cost of holding money	Adj. ex ante real rate 1	Adj. ex ante real rate 2	Adj. ex ante real rate 3	Ex post real rate	Dummy	R ²	DW
22	9.8260* (3.5085)	-0.1458 (-0.5236)	0.2340* (3.5723)	-0.1638** (-2.4309)				0.2604* (2.5651)	0.75	2.99
23	9.7247* (3.8600)	-0.1316 (-0.5252)	0.2337* (3.9453)		-0.1527** (-2.8710)			0.2167** (2.3130)	0.79	3.145
24	8.09388* (3.4782)	0.0276 (0.1184)	0.2605* (4.1040)			-0.1972* (-2.8927)		0.2659* (2.8550)	0.79	2.97
25	-6.4015* (-7.3997)	1.4588* (16.0541)	-0.0803 (-1.6350)				0.4323* (4.5615)	0.5509** (3.7810)	0.96	1.89

t-values in parenthesis

*significant at 1 per cent level

** significant at 5 per cent level

Tables 4 and 5 suggest that the debt-intermediation hypothesis, which emphasizes the role of deposit accumulation in expanding the lending potential of financial intermediaries, seems to be more strongly supported in Nigeria than the complementarity hypothesis of McKinnon, which is only weakly supported. The result contrasts with that of Ajewole (1989) in that it shows that the *ex post* real interest rate is a significant determinant of the real money demand in Nigeria. An important methodological implication of this study is that the *ex post* real interest rate, though less theoretically elegant, seems to be a better determinant of savings and demand for money in Nigeria.

A policy implication of the relative support for the applicability of Shaw's debt-intermediation model over that of McKinnon's complementarity hypothesis is the possible need to intensify measures to improve the savings habit of Nigerians. New initiatives in this regard are the People's Bank and the Community Banking Scheme. These two schemes are directed at mobilizing rural deposits and giving credit facilities to rural dwellers without using orthodox banking practices like tangible collateral to protect the security of loans. In contrast, the schemes use group pressures and personal knowledge of loanees to advance credit. In part, this study appears to give some justification to this policy initiative.

IV Summary and conclusion

In this paper, we have analyzed the impact of the policies of regulation and deregulation on savings mobilization in Nigeria. It shows that there is support, albeit weak, for the position that financial liberalization in Nigeria is a possible way of promoting savings. This study corroborated the findings of Soyibo and Adekanye (1990b) using descriptive indices. It also established that the determinants of savings in Nigeria are:

- lagged aggregate savings ratio;
- lagged aggregate savings;
- current GDP;
- foreign savings; and
- *ex post* real interest rate.

The paper also shows that the debt-intermediation hypothesis of Shaw is more relatively supported by Nigerian data than the complementarity hypothesis of McKinnon. It therefore sees such policy initiatives like the operations of the People's Bank and Community Banks which aim at encouraging the savings habit of Nigerians as steps in the right direction.

The study also established that the *ex post* real interest rate is both a significant determinant of savings and real stock of money demand in Nigeria. Finally, it established that the use of the adjusted *ex ante* real interest rates in the savings equation and money demand equations, though theoretically elegant, does not seem to make any difference empirically as they are, in most cases, not significant and often tend to have the wrong sign.

Further research may reveal whether *ex ante* real rates can be useful for empirical purposes. An investigation of the theoretical under-pinnings of their observed empirical behaviour is also a possible area of research. Other areas that require further study relate to the link between savings mobilization and investment, and the extent to which non-bank financial intermediaries, which are now becoming a potent force in the mobilization of deposits, are competitors to the banks. Such studies can analyze the types of non-bank financial intermediaries, their scope of operations and potential for the future.

Appendix

Real interest rate measurement

The real interest rate is usually measured using the Fisherian equation:

$$(A1) \quad r = \frac{1+n}{1+p} - 1$$

where r = real interest rate
 n = nominal interest rate
 p = inflation rate.

It is easily shown that (A1) is equivalent to the non-linear form

$$(A2) \quad n = r + p + rp$$

from which we obtain the linear approximation

$$(A3) \quad n = r + p$$

From (A3) we can solve for r to obtain

$$(A4) \quad r = n - p$$

which shows that r can be positive or negative depending on whether the inflation rate is less or greater than the nominal interest rate.

There are two types of real interest rate: *ex ante* and *ex post* or realized real interest rate. While the *ex ante* real interest rate affects savings and investment decisions, it is the *ex post* rate that is directly measurable (Cecchetti, 1986).

The real interest rate specified by equations (A1)-(A4) above can be correctly referred to as the *ex post* rate only. The *ex ante* counterpart requires an estimate of the *expected* inflation rate. Thus the *ex post* and *ex ante* real interest rates would differ by the amount of the *unexpected* inflation, since the inflation rate cannot be perfectly anticipated.

An estimate of the *ex ante* real interest rate, r^* , can be obtained following Cecchetti (1986) by regressing the *ex post* real interest on a set of variables thus:

$$(A5) \quad r_t = f(P_{t-1}, \Delta I_{t-1}, \Delta M_{2t-1})$$

where ΔI_{t-1} = lagged growth in industrial production
 ΔM_{2t-1} = lagged growth in broad money supply M_2

with other variables as previously defined. Having estimated equation (A5), the fitted value gives the estimate of the *ex ante* real rates, r^* .

It has been observed that deregulation and procedural changes affect the roles of conventionally measured real rates (Lombra, 1984). Accordingly, the real rates measured by equations (A1)-(A5) need to be adjusted to capture the implicit price effect of credit rationing brought about by procedural changes and deregulation. The *adjusted ex ante* real interest rate, r^a , resulting from this exercise can therefore be stated as:

$$(A6) \quad r^a = r^* + \delta$$

where δ is the estimate of the implicit price (non-price) items which can be obtained from the fitted values to the equation

$$(A7) \quad \delta = \alpha_0 + \alpha_1 (n - n_c)$$

with n_c being the nominal interest rate ceiling, and $\alpha_0, \alpha_1 > 0$. For measurement purposes in (A6), n_c can be proxied by the three-month treasury bill rate, while δ is proxied by the deposit rate for new mortgage loans.

In effect, the real interest rate can be measured in three forms, namely, *ex post*, *ex ante* and *adjusted ex ante* real interest rate. Most studies on money supply, savings and investment in Nigeria have used a nominal and, at best, linear approximation of the *ex post* real interest rate (e.g. Ajayi and Ojo, 1986; Oyejide, 1972; Teriba, 1974; Owosekun, 1978; Ogiogio, 1988; and Ajewole,

1989). This may partly explain the conflicting results of the role played by the real interest rate on money supply, savings mobilization and investment in Nigeria. However, given the long period of financial repression in Nigeria, we believe that the adjusted *ex ante* real interest rate will be more appropriate in explaining the savings behaviour of Nigerians.

Data were collected on different types of nominal interest rates in Nigeria for the period 1969-88. These were the CBN minimum rediscount rate, commercial bank prime rate, Federal Savings Bank rate, minimum lending rate, maximum lending rate, savings rate, six month deposit rate, over twelve month deposit rate, Treasury Bill rate, one and two year Treasury Certificate rates. Each of these rates was subjected to analysis in order to estimate its corresponding *ex post*, *ex ante* and adjusted *ex ante* real interest rates using equations (A4)-(A7). A term structure of the *ex ante* real interest rate of Nigeria was then constructed following Cecchetti (1986) in order to derive a descriptive explanation rate for changes of monetary and financial policies on the real interest rate in Nigeria, using selected years.

Table A1 shows the regression results of the estimation of the *ex ante* real interest rates for ten principal interest rates in Nigeria. These are the CBN's minimum rediscount rate, the Treasury Bill rate, the Treasury Certificate rates (one and two year), three types of deposit rates (savings, six month, and maximum term), as well as three types of lending rate (commercial bank prime rate, minimum and maximum lending rates). Of all the equations, only the lagged growth in money supply is significant. The variables used explained between 41 and 45 per cent of the variation in the *ex ante* real interest rate.

Given this development of the non-significance of the many explanatory variables, we tried other specifications for estimating the *ex ante* real interest rate. In particular, we expressed the *ex ante* real interest rate as a function of lagged growth in deposit rate, lending rate in place of a lagged growth in industrial production, as well as a function of the nominal rate. This specification produced reduced R^2 and all the explanatory variables, including lagged growth in M_2 , were no longer significant.

Table A2 gives the estimation results of the *ex ante* real interest rate with lagged growth in broad money supply as the *only* explanatory variable. We call this approach the modified Cecchetti methodology, given the fact that not all variables specified by Cecchetti (1986) were used. As expected, the R^2 dropped to between 31 and 37 per cent, and the level of significance of the regression equations improved appreciably. We believe that the modified Cecchetti methodology will provide better estimates of the *ex ante* real interest rate for Nigeria because the estimated coefficients of those non-significant explanatory variables might introduce some "noise" into the final estimates. However, we provide both estimates for comparative purposes.

Following Lombra (1984), we estimated the adjusted *ex ante* real interest rate for Nigeria using equations (A6) and (A7). Table A3 gives the result of this estimation. For all the estimated equations, the constant term was significant at the 1 per cent level, but this only applied in three cases, namely commercial bank prime lending rate, Federal Savings Bank rate, and maximum term rate, where the coefficient of the explanatory variable was significant at the 5 per cent level. The coefficient of determination for the estimated equations varies between 38 and 46 per cent. One conclusion that can be drawn from Table A3 is that the methodology suggested by Lombra (1984) *cannot* be applied to all interest rates in Nigeria. Accordingly, for the study, it was applied to only those rates for which the estimated coefficients are significant.

Tables A4 to A7 show the values of different real interest rates estimated using the procedures described above and used in this study.

Table A1 *Ex ante* real interest rate estimation equations

	Constant	P(-1)	1(-1)	M2(-1)	R2	SSR	DW	F	Significance
Minimum rediscount rate	-3.1851 (-0.4855)	0.1284 (0.4700)	12.2410 (1.2371)	-0.4134* (-2.800)	0.42	10.25	1.77	3.10	0.06
Treasury Bill rate	-4.4635 (-0.6990)	0.1418 (0.5334)	0.2668 (1.4074)	-0.4197* (-2.9197)	0.45	9.97	1.83	3.47	0.05
1 year Treasury Certificate rate	-4.1350 (0.6456)	0.1424 (0.5341)	0.2645 (1.3909)	-0.4082* (-2.8311)	0.43	10.01	1.83	3.28	0.06
2 year Treasury Certificate rate	-3.9326 (-0.5993)	0.15114 (0.5532)	0.2346 (1.2042)	-0.4092* (-2.7696)	0.41	10.25	1.85	3.29	0.07
Savings deposit rate	-3.9326 (-0.5993)	0.15114 (0.5532)	0.2346 (1.2042)	-0.4092* (-2.7696)	0.41	10.25	1.85	3.00	0.07
6 month term rate	-4.8228 (-0.7770)	0.1696 (0.6562)	0.2921 (1.5851)	-0.4044* (-2.8939)	0.45	9.70	1.84	3.56	0.04
Maximum term rate	-1.8412 (-0.2823)	0.1007 (0.3708)	0.2308 (1.1917)	-0.4229* (-2.9232)	0.44	10.19	1.88	3.32	0.05
Commercial bank prime rate	-3.2834 (-0.4950)	0.1670 (0.6046)	0.2935 (1.4902)	-0.3959* (-2.6508)	0.42	10.36	1.74	3.03	0.07
Minimum lending rate	-1.5049 (-0.2265)	0.0964 (0.3483)	0.2907 (1.4736)	0.4044* (-2.7036)	0.43	10.38	2.0	3.21	0.06
Maximum lending rate	1.3789 (0.2115)	0.1539 (0.5671)	0.2904 (1.5062)	-0.4109* (-2.799)	0.43	10.19	1.94	3.33	0.05

* Significant at 5 per cent level
t-values are in parenthesis

Table A2 Estimation of *ex ante* real interest rate with growth in broad money supply as the only explanatory variable (modified Cecchetti methodology)

	Constant	M2(-1)	R2	SSR	DW	F	Significance
Rediscount rate	0.5223 (0.1169)	-0.4081 (-2.8250)	0.35	10.10	1.77	7.98	0.01
Treasury Bill rate	-0.35635 (-0.0823)	-0.4139* (-2.8988)	0.36	9.98	1.83	8.40	0.01
1 year Treasury Certificate rate	-0.0444 (-0.0101)	-0.4024* (-2.8138)	0.35	9.99	1.83	7.92	0.01
Savings deposit rate	0.0414 (0.0093)	-0.0423* (-2.7933)	0.34	10.06	1.90	7.80	0.01
Maximum term rate	0.3988	-0.4257*	0.37	10.0	1.90	8.83	0.01
Commercial bank prime rate	1.3796 (0.2986)	-0.3887* (-2.6008)	0.31	10.4	1.74	6.76	0.02
Minimum lending rate	2.1518 (0.4635)	-0.4020* (-2.6767)	0.32	10.5	1.86	7.17	0.02
Maximum lending rate	5.8359 (1.2832)	-0.4046* (-2.7500)	0.34	10.28	1.85	7.56	0.02

* Significant at 5 per cent level
t-values are in parenthesis

Table A3 Estimation of the coefficient of the adjusted *ex ante* real interest rate

	Constant	$n-n_c$	R2	SSR	DW	F	Significance
Commercial bank prime rate	14.4844* (14.2405)	-1.1479* (-2.8985)	0.46	2.05	1.3	8.4	0.02
Federal savings bank rate	13.6013* (15.4485)	-1.6264* (-2.4714)	0.38	2.19	0.7	6.11	0.03
Maximum lending rate	9.9612* (10.4883)	0.6238* (2.8623)	0.45	2.06	1.2	8.19	0.02

* Significant at 5 per cent level
t-values are in parenthesis

Table A4 *Ex post* real interest rate in Nigeria (per cent)

Year	Minimum discount rate	Treasury Certificate rate			Deposit rate			Lending rate		
		Treasury Bill rate	1 year	2 years	Savings	6 month term	Maximum term	Commercial bank prime	Min.	Max.
1972	1.7	1.4	1.9	2.0	0.4	0.9	1.4	4.4	4.4	9.4
1973	-1.4	-1.7	-1.2	-1.1	-2.7	-2.2	-1.7	2.4	1.3	6.3
1974	-8.0	-8.3	-7.8	-7.7	-9.3	-8.8	-8.3	-4.5	-5.3	-2.3
1975	-30.4	-31.1	-29.1	-29.0	-29.6	-30.6	-29.6	-27.8	-27.6	-24.6
1976	-21.1	-21.8	-21.3	-21.2	-20.3	-20.8	-20.8	-18.5	-18.3	-14.3
1977	-15.3	-16.3	-15.8	-15.7	-15.3	-16.3	-17.3	-13.3	-13.3	-9.3
1978	-14.6	-14.6	-14.1	-14.0	-14.6	-13.3	-13.1	-11.6	-11.6	-7.6
1979	-6.1	-7.1	-6.6	-6.5	-6.1	-5.9	-5.6	-4.1	-4.1	-0.1
1980	-5.4	-6.4	-5.9	-5.4	-5.4	-5.15	-4.9	-3.4	-3.9	0.1
1981	-11.8	-15.8	-15.3	-14.8	-14.8	-14.3	-14.3	-12.3	-13.3	-9.3
1982	-0.7	-0.7	-0.2	-0.3	-0.8	-1.2	1.3	1.8	2.8	6.3
1983	-16.2	-16.2	-15.7	-15.2	-15.7	-14.5	-13.7	-13.2	-13.7	-10.3
1984	-13.2	-32.7	-32.2	-31.7	-31.7	-33.2	-31.2	-31.2	-34.2	-28.2
1985	7.1	5.1	6.1	6.6	6.6	6.9	7.1	6.9	5.6	10.1
1986	4.6	3.1	3.6	4.1	4.1	4.4	5.6	5.0	5.1	6.6
1987	3.2	1.6	2.1	2.6	3.8	0.3	5.6	0.2	7.3	8.8
1988	-25.3	-26.5	-26.0	25.5	-26.3	-23.0	-23.8	-27.9	-21.3	-20.3

Table A5 *Ex ante* real interest rate in Nigeria using the Cecchetti methodology (per cent)

Year	Minimum discount rate	Treasury Certificate rate			Deposit rate			Lending rate		
		Treasury Bill rate	1 year	2 years	Savings	6 month term	Maximum term	Commercial bank prime	Min.	Max.
1972	3.5	3.2	3.6	3.9	3.0	4.3	4.0	5.9	6.4	10.6
1973	-8.9	-0.9	-9.4	-9.0	-9.6	-9.5	-8.1	-7.8	-6.4	-3.5
1974	-9.8	-10.8	-10.2	-9.8	-10.1	-10.1	-9.2	-8.4	-7.3	-4.2
1975	-27.9	-29.3	-28.2	-28.0	-28.1	-28.2	-28.0	-36.1	-25.7	-22.6
1976	-25.8	-27.1	-26.1	-25.8	-25.4	-25.8	-26.3	-23.8	-24.9	-20.5
1977	-7.2	-7.9	-7.3	-7.1	-7.4	-6.8	-7.1	-5.3	-5.3	-1.2
1978	-4.6	-5.5	-5.0	-4.7	-4.9	-4.9	-4.1	-3.3	-3.0	-0.9
1979	-6.6	-7.7	-7.2	-6.8	-6.9	-7.3	-6.1	-5.7	-5.3	-1.5
1980	-11.2	-11.8	-11.0	-10.8	-11.7	-10.3	-11.2	-8.4	-7.9	-4.6
1981	-18.2	-19.6	-18.9	-18.5	-18.6	-19.1	-11.8	-17.3	-16.6	-12.3
1982	-17.5	-8.8	-8.3	-7.7	-8.6	-8.6	-6.8	-6.7	-6.8	-2.8
1983	-5.4	-8.2	-5.7	-5.4	-5.0	-5.6	-4.7	-3.9	-2.9	0.3
1984	-13.8	-15.5	-14.9	-14.5	-13.8	-15.6	-13.1	-14.0	-14.0	-9.9
1985	-5.8	-6.8	-6.2	-5.9	-5.5	-5.9	-5.8	-4.3	-5.5	-0.4
1986	-4.2	-5.1	4.7	-4.3	-4.9	-4.8	-3.3	-3.2	-1.7	1.2
1987	-6.7	-8.0	-7.5	-7.1	-7.2	-8.1	-5.6	-6.5	-5.2	-2.0
1988	-10.5	-11.4	-10.7	-10.4	-11.0	-10.5	-10.1	-8.7	-8.0	-4.7

Table A6 *Ex ante* real interest rate in Nigeria using the Cecchetti methodology (per cent)

Year	Minimum discount rate	Treasury Certificate rate			Deposit rate			Lending rate		
		Treasury Bill rate	1 year	2 years	Savings	6 month term	Maximum term	Commercial bank prime	Min.	Max.
1972	-2.7	-3.6	-3.2	-2.9	-3.1	-3.3	-2.0	-1.7	-1.0	2.6
1973	-8.7	-9.7	-9.1	-8.8	-9.1	-9.1	-8.2	-1.4	-6.9	-3.3
1974	-10.6	-11.6	-11.0	-10.7	-10.9	-10.9	-10.2	-9.2	-8.8	-5.2
1975	-26.9	-28.0	-26.9	-26.6	-26.8	-26.6	-27.0	-24.5	-24.6	-21.1
1976	-24.6	-25.9	-14.8	-24.6	-24.7	-24.6	-24.8	-22.6	-22.6	-19.1
1977	-10.0	-11.0	-10.4	-10.0	-10.3	-10.3	-9.5	-8.6	-8.2	-4.6
1978	-5.2	-6.1	-5.3	-5.6	-5.6	-5.7	-4.5	-4.0	-3.5	-0.2
1979	-5.7	-6.7	-6.2	-5.9	-6.1	-6.2	-5.1	-4.6	-4.0	-0.4
1980	-16.7	-17.8	-10.0	-10.7	-10.9	-16.9	-16.5	-15.0	-14.8	-11.2
1981	-15.5	-16.7	-15.9	-15.6	-15.8	-15.8	-15.4	-13.9	-13.9	-10.1
1982	-4.5	-5.4	-5.0	-4.6	-4.9	-5.0	-3.8	-3.4	-2.8	0.9
1983	-3.8	-7.8	-7.3	-6.9	-7.2	-7.2	-6.2	-5.6	-5.1	-1.4
1984	-6.9	-7.9	-7.4	-7.0	-7.3	-7.4	-6.4	-5.7	-5.2	-1.5
1985	-6.1	-7.1	-6.6	-6.2	-6.5	-6.6	-5.5	-4.9	-4.4	-0.8
1986	-4.5	-5.4	-5.0	-4.6	-4.9	-5.0	-3.8	3.4	-2.8	0.9
1987	-3.1	-4.0	-3.6	-3.3	-3.5	-3.9	-2.4	-2.1	-1.4	2.3
1988	-12.3	-13.3	-12.7	-12.4	-12.6	-12.6	-11.9	-10.0	-10.4	-6.9

Table A7 *Adjusted ex ante* real interest rate in Nigeria (per cent)

	Commercial bank prime rate	Maximum term rate	Federal savings rate
1977	2.2	4.7	0.2
1978	5.9	12.4	4.5
1979	6.4	11.7	5.7
1980	-4.0	0.8	-4.4
1981	-3.4	1.9	-3.4
1982	10.5	12.8	8.4
1983	8.3	10.6	5.0
1984	7.1	10.0	4.2
1985	7.3	11.0	3.8
1986	8.6	12.9	6.1
1987	11.7	15.0	9.9
1988	5.3	5.5	3.4

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